

Energy Management

Energy Management Good Practice Guide

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Facility Management Association of Australia Ltd

ABN: 57 003 551 844

GPO Box 178
Melbourne Victoria 3001
Phone: +61 3 8641 6666
Fax: +61 3 9640 0374

policy@fma.com.au
www.fma.com.au

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Preface

The Facility Management Association’s (FMA’s) Good Practice Guides provide detailed, objective and independent information on key areas of interest for facilities management professionals and stakeholders in Australia.

Our latest Good Practice Guide on Energy Management is designed to arm professionals with the information and resources needed to achieve more efficient energy outcomes across a range of facilities, including offices, retail, education, entertainment, community and health.

Improving energy management will deliver numerous benefits to businesses and workplaces, from improved comfort and productivity to reduced operating costs and greenhouse gas emissions.

Facilities managers are uniquely placed to enhance energy management within the built environment. They have an intricate knowledge of the various buildings they manage plus a broad network of stakeholders, given their frequent interactions with everyone from owners and occupants to the service providers responsible for plant and equipment. The guide is also useful to a range of building stakeholders (Table 1).

As we face the post-COVID world and the looming climate crisis, there is a general consensus that energy efficiency will play a key role in Australia’s economic recovery. In addition to creating jobs and slashing energy bills, energy efficiency is the cheapest way to cut emissions.

Given that buildings account for up to 40% of total energy consumption and emissions, we are confident that this guide will play an important role in Australia’s transition towards a low-carbon future.

This important document would not have been possible without the support of the Commonwealth Government and the funding provided through the Climate Solutions Package.

The Good Practice Guide on Energy Management aligns with the FMA’s mission to inspire, shape and influence the facilities management industry, and to promote and represent the interests of facilities managers, both nationally and internationally. It forms part of our broader role to support all professionals and organisations involved in the management, operation and maintenance of buildings, precincts and community infrastructure throughout Australia.

I hope this guide helps you to assess your energy management outcomes; to develop and implement new strategies; and to evaluate the cost and benefits of such initiatives.

As always, we welcome your feedback! Please email info@fma.com.au.

Yours sincerely,

Nicolas Burt
Chief Executive Officer
Facility Management Association of Australia

Table 1: Parts of the guide most relevant to building stakeholders

Stakeholder	Relevant chapters
FM professionals	ALL
Building/ facilities owners and managers	2,4,5
Designers	3,4
Maintenance providers and technicians	2,3,4
Tenants and occupants	2,4,5
Energy management consultants	2,3,4,5,6
Finance managers	2,5

1. About this guide

This guide outlines the actions that facilities managers (FMs) can take to add value to the facilities that they manage through a structured approach to energy management.

Energy management is the process of monitoring, controlling, and minimising energy consumption through bill contract management, energy efficiency improvements and renewable energy sourcing and generation. It can deliver a wide range of benefits to building stakeholders - from lower operating costs and greenhouse gas emissions through to improved comfort and productivity.

While there have been major improvements in energy management over the past decade, there remain significant additional opportunities. These opportunities are accessible across a range of building types and sectors including office, retail, education, residential, accommodation and health care.¹

Energy management has become an essential knowledge and skill requirement for FM. That is because:

- The benefits of energy management are well established but in many cases are not being achieved.
- There is a growing focus on energy performance through building rating schemes such as the National Australian Built Environment Rating System (NABERS) and Green Star, and through compliance requirements such as the Commercial Building Disclosure (CBD) Program.
- An increasing number of facility owners (including Local, State and Commonwealth Governments) are developing ambitious greenhouse gas and energy reduction targets.
- Owners and tenants recognise that to achieve the full benefits of energy management co-ordination between multiple building stakeholders including owners, tenants, maintenance contractors, energy retailers and equipment suppliers is essential. Building owners and tenants increasingly recognise that FMs are uniquely placed to support improvement.

This guide has been designed to assist FM professionals to coordinate and drive improvements in the facilities that they manage. FMs with limited energy management experience can work through the guide sequentially to inform the development of an energy management plan² and to identify the improvements that can deliver quick and 'early wins'. For experienced FMs the guide can provide a useful reference to identify gaps in current approaches and to establish the most relevant next steps.

Parts of the guide can also be used by other building stakeholders (Table 1). For example, the description of energy performance improvements that are outlined in Chapter 4 can help tenants, contractors and energy management consultants work with FMs to identify and put forward suggestions for improvement.

Every facility is unique and energy management strategies need to be carefully customised to be most effective. To enable customisation of your actions the guide has been structured as follows:

- Energy management plan and business case templates have been developed to assist FMs to apply the information in each chapter to the unique aspects of the facilities they manage.
- Quick start guides for each of the main facility types encourage early and effective action by outlining the most common improvement opportunities in each sector with links to relevant industry case studies.
- Throughout the guide extensive weblinks are provided to enable FMs to obtain further detailed information where required.
- Each of the main chapters provide an overview of good practice energy management from a facilities management (FM) perspective.

Chapter 2 outlines the **benefits of energy management**, the interests of different stakeholders and strategies that practitioners can use to establish and communicate the benefits through effective stakeholder engagement and communication.

Chapter 3 describes the main sources of **energy data** and ways in which it can be analysed in conjunction with operational data and business plans to benchmark, report and engage building stakeholders in energy management.

Chapter 4 illustrates different ways to **identify energy management opportunities** effectively including through the use of energy audits and by drawing on the experience of key building stakeholders. Typical opportunities are outlined in a range of areas including energy supply, heating, ventilation and air conditioning (HVAC), lighting and office equipment.

Chapter 5 presents a range of **funding** options that can be used to finance energy projects and ways FMs can influence energy efficiency aspects of the design of building upgrades. Tips for developing effective business case proposals are described.

Chapter 6 outlines approaches that can be implemented to develop an **energy management system** that will help to **drive continuous improvement**.

¹ See Appendix C for key opportunities in each of these sectors

² See Appendix B

2. Establish and communicate the benefits of energy management

Establish and communicate the benefits of energy management to build stakeholder support and access the resources required to improve energy performance.

Energy management can deliver a wide range of business benefits to facility owners and other stakeholders. However, a major barrier to implementation is a lack of awareness of energy management benefits and the rationale for action.

This chapter examines:

- the benefits of energy management
- how FMs can link the interests of facility stakeholders to energy management benefits
- how FMs can promote energy management to build stakeholder support

2.1 The benefits of energy management

The key benefits of energy management are outlined in Figure 1 and described below.

Enhance energy security

Energy is such a fundamental business input, that its importance is often taken for granted. Consider the implications for a commercial building if supply is disrupted. Without backup power the central functions of buildings become inoperable. Tenants would be uncomfortable and without lighting it may be unsafe to move

about. Lifts would not be available to transport building occupants and business equipment would no longer operate.

Energy management includes consideration of what backup power is available in a facility, how and when it should be used and, in the case of a supply disruption, what actions should be taken.

Lower energy bills and other operating costs

Because energy use is often taken for granted there can be limited attention to the cost structure of energy supply contracts and unnecessary energy use.

By reviewing energy supply contracts and implementing energy efficiency initiatives energy bills can be reduced. Energy efficiency initiatives can also lead to reduced maintenance costs due to lower equipment run times and fewer breakdowns.

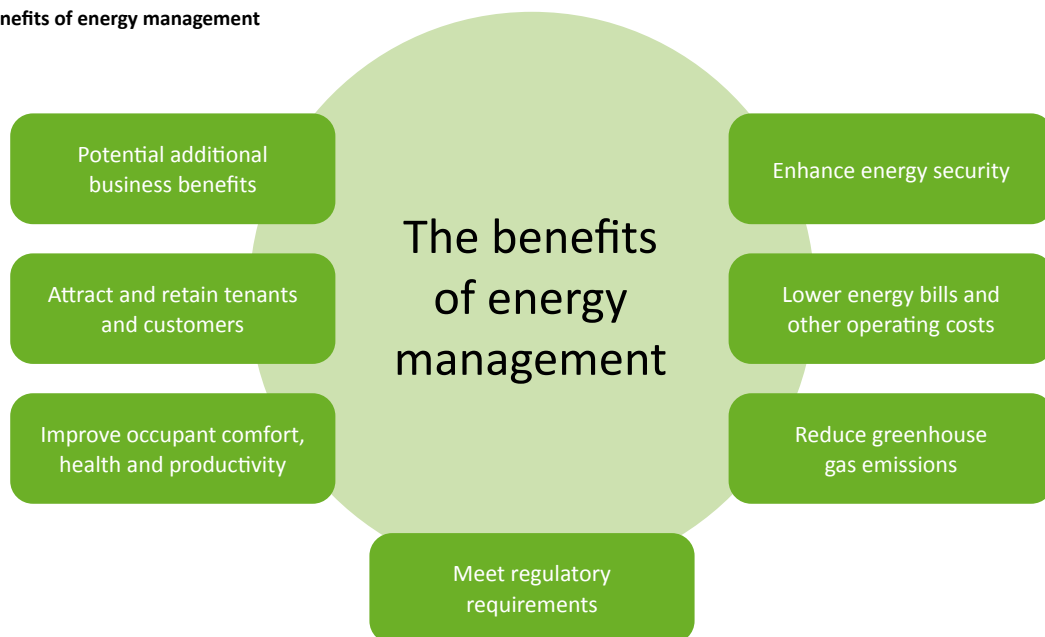
Reduce greenhouse gas emissions

More efficient use of energy is a key strategy for reducing emissions where energy is sourced by fossil fuels. The availability of alternative supply contract arrangements as well as onsite installation of solar panels also addresses the supply side and sends a powerful message of effort and commitment to reduce greenhouse gas emissions. In turn, this can help meet building owner and tenant environmental goals and targets.

Meet regulatory requirements

A structured approach to energy management can assist a facility to meet current legislation and improve its preparedness for potential further legislation.

Figure 1: The benefits of energy management



For example, the Commercial Building Disclosure (CBD)³ program was introduced by the Australian government through the Building Energy Efficiency Disclosure Act 2010. At the time of writing CBD requires sellers or lessors of office space with a net lettable area of 1,000m² or more to obtain and disclose a current Building Energy Efficiency Certificate (BEEC). The BEEC includes a NABERS Energy star rating and an assessment of tenancy lighting for the area of the building being sold or leased.

Improve occupant comfort, health and productivity

A focus on energy management can address existing problems associated with building operation that impact on building occupants. For example, retuning HVAC systems for energy efficiency can increase occupant comfort and wellbeing (Table 2).

Table 2: Reduction in occupant dissatisfaction for a building involved in the Sustainability Victoria Energy Efficiency Office Buildings Program⁴

Parameter	Change
Dissatisfaction with temperature	Down 35%
Dissatisfaction with air movement	Down 17%
Dissatisfaction with humidity	Down 14%
Dissatisfaction with air quality	Down 19%
Number of sick leave days	Down 24%

These types of initiatives can also reduce the time FMs require to respond to occupant complaints.

Attract and retain tenants and customers

Tenants and customers can be attracted by the benefits of reduced energy and operation costs as well as improved comfort. Tenants and customers with commitments to reducing greenhouse gas emissions may also actively seek facilities that can demonstrate that emissions have been reduced.

Research by the World Green Building Council has found that buildings with a green rating report an occupancy rate increase of up to 23%. Rental premiums were also found to increase by an average of 3% for each additional level of certification.⁵

Potential additional business benefits

There are a number of other potential benefits. For example, improved energy management can:

- Improve the corporate reputation of building owners and tenants
- Assist organisations to achieve sustainability/environmental/triple bottom line goals and targets
- Encourage a culture of collaboration amongst staff by involving them in energy initiatives

- Provide access to government and other funding for building upgrades where it can be shown that energy efficiency will be improved and greenhouse gas emissions will be reduced.

2.2 Linking benefits to stakeholder interests

Energy management cannot be achieved by a single person or organisation. It requires a high level of collaboration between many different building stakeholders to achieve optimal outcomes. FMs are in a unique position to both motivate and co-ordinate the actions of these stakeholders to improve energy performance.

Stakeholder engagement is essential because many stakeholders may view energy management as an 'additional' burden - creating more work or complexity to their workplace activities. Wherever possible stakeholder communication should be tailored to the interests of individual managers and business functions to promote energy management as an activity that helps achieve their goals and interests rather than hindering their efforts or creating additional workload.

Engagement is also essential to establish who will pay for improvements and what benefits will be achieved. Investment decisions may be influenced by the type of lease in place, the nature of the upgrades and whose energy bill will be reduced and over what time period.

Considerations for engaging key stakeholders are summarised in Table 3. The role, interests and approach to engaging stakeholders is described below.

Senior managers

Senior management support is essential to endorse the importance of energy management to the organisation and to allocate sufficient resources to ensure that improvement can be achieved.

Prior to meeting with senior managers ensure that you have an understanding of current business issues and priorities. Where possible it is useful to work with a senior manager that can 'champion' energy management.

In communications with senior management it is important to link energy management to current business priorities and emphasise how energy management can impact on compliance, cost containment, profitability, occupancy, asset value, reputation and other strategic issues.

Finance/ asset managers

Finance and asset managers will typically be a key part of the sign off process for energy management business case proposals.

³ See the CBD program website <https://www.cbd.gov.au>

⁴ <https://www.sustainability.vic.gov.au/Business/Energy-efficiency-for-business/Commercial-buildings/Sector-research-and-reports>

⁵ <https://www.worldgbc.org/news-media/business-case-green-building-review-costs-and-benefits-developers-investors-and-occupants>

Table 3: Key facility stakeholders and strategies to engage with them on energy management

Stakeholder	Communication approach
Senior managers	Emphasise bottom-line benefits (cost savings), meeting compliance requirements and enhancing the reputation of the business and its facilities.
Financial / asset managers	Use their language. For example, in business case proposals use the financial metrics (internal rate of return/ net present value) that are relevant to them.
Procurement managers (energy)	Emphasise potential cost savings in the changing energy market and opportunities to cost-effectively source renewable energy.
Sustainability managers	Explore the potential to meet sustainability goals through energy management initiatives and seek input on what can be learnt from the success of other sustainability initiatives.
Leasing managers	Discuss tenant interests and needs and how energy management can align with those.
Tenants, building occupants and customers	Link energy management improvements to cost savings, comfort, safety and productivity. Promote achievements.
Owners / Investors	Promote performance in terms of both sustainability metrics and investment performance. Promote objective metrics such as NABERS and Green Star ratings as well as results on the Global Real Estate Sustainability Benchmark (GRESB) where available.
Government	Consider participation in voluntary programs and clarify compliance requirements.

Therefore, it is important to engage with them early in order to understand the way in which proposals should be presented including the information required and the financial metrics that are used within the organisation.

Procurement managers (energy)

Personnel responsible for procuring energy can help you to understand the structure of energy bills and the benefits and limitations of existing energy contracts. Highlight potential savings through energy efficiency and by reducing peak demand charges.

Sustainability managers

Sustainability managers will have a natural interest in supporting energy management initiatives. They may be able to provide advice and insights on what has worked well (or hasn't) in other facilities and any resources and support that may be available.

Leasing managers

Leasing managers can provide insights into tenant interests and the timing of existing contracts. They can help you to clarify leasing schedules, whether any 'green lease' clauses are in place and relevant requirements outlined in service level contracts. In turn, you may be able to share insights on tenant needs from your perspective and to promote opportunities for greater collaboration with tenants around energy management issues.

Tenants, building occupants and customers

If a facility is tenanted, then tenant behaviours could influence energy consumption in the base building as well as the tenancy. It is important to understand their requirements. Where there are existing issues (e.g. around comfort levels) there may be

opportunities to link energy management initiatives to the resolution of these issues.

Other facility occupants and/or customers may have an interest in energy management and sustainability. It is important to promote what has been done and future plans. For example, corporate users of hotels may require information on energy, greenhouse gas and sustainability issues as part of their procurement / selection process.

Owners / investors

There are a number of business drivers that help to highlight the importance of energy management to building owners and investors. These include:

- Owner-level energy and greenhouse gas targets and goals
- The Green Star Rating Scheme⁶
- Green leases that outline shared responsibilities and benefits from energy management and other sustainability initiatives⁷
- The Global Real Estate Sustainability Benchmark (GRESB) which provides a benchmark of the Environmental, Social and Governance (ESG) performance of real estate assets through an annual survey and report.⁸

Government

All levels of government in Australia (Commonwealth, State/ Territory and Local) have an interest in encouraging improved energy management in buildings. From a government perspective the benefits of energy management include:

⁶ See the Green Building Council of Australia website <https://www.gbca.org.au>

⁷ <https://www.betterbuildingspartnership.com.au/projects/green-leasing/>

⁸ <https://www.gresb.com>

- reducing demand for energy infrastructure such as additional power stations and distribution equipment
- reducing greenhouse gas emissions to meet international agreements and their own commitments (such as Australia's 2015 Paris Agreement target to reduce emissions to 26–28 per cent on 2005 levels by 2030)
- creating jobs
- enhancing business productivity.

Nationally, energy management initiatives are co-ordinated through the National Energy Productivity Plan.⁹ This is supported by state and local jurisdictions who also deliver their own programs. Key government initiatives are discussed below. The www.energy.gov website provides a useful information hub for energy programs and information that are relevant to facilities.

- *National Energy Productivity Plan and Trajectory for Low Energy Buildings*

The National Energy Productivity Plan (NEPP)¹⁰ is a package of measures that the Commonwealth, State and Territory Governments agreed to in order to improve Australia's energy productivity by 40% between 2015 and 2030. See: <https://www.energy.gov.au/government-priorities/energy-productivity-and-energy-efficiency/national-energy-productivity-plan>

- *The NABERS rating scheme*

Without accessible information on the energy and greenhouse gas performance of a building, it is difficult for investors, tenants and other stakeholders to compare buildings and building portfolios. NABERS is a national initiative managed by the NSW Department of Planning, Industry and Environment. It provides a framework through which the environmental performance of buildings can be measured and easily compared through a star rating system (1 to 6 stars). See: www.nabers.gov.au

- *Business Energy Advice Program – www.businessenergyadvice.com.au*

The Business Energy Advice Program provides energy management advice to small businesses. This includes assistance in energy procurement and energy efficiency.

- *The CitySwitch Green Office program – www.cityswitch.net.au*

The CitySwitch program is managed by the City of Sydney but available in many cities around Australia. The program provides commercial office tenants with access to one-on-one support and a wide network of other companies taking steps to improve their sustainability.

- *Incentives for energy management*

Governments also provide a range of *incentives* to support investment in energy management. The most common and enduring approach to incentivising energy efficiency initiatives has been through market-based certificate schemes such as the NSW Energy Savings Scheme (ESS),¹¹ Victorian Energy Upgrades (VEU)¹² program, the ACT Energy Efficiency Improvement Scheme (EEIS)¹³ and the South Australian Retailer Energy Efficiency Scheme (REES)¹⁴. While the details of each scheme vary, essentially, they help to reduce the costs associated with the purchase and installation of energy efficient equipment.

2.3 Communication strategies to engage stakeholders

As highlighted in the previous section, while many of the benefits of energy management are common in most buildings, there can also be differences.

From an FM perspective it is important to:

- identify the stakeholders that are most relevant to energy management in the building
- establish the benefits that are most relevant to them
- clarify their level of interest in energy management and any specific expectations that they have
- find out what is important to them, the policies and targets they have in place, and their expectations from an energy management perspective.

This kind of background research can provide the foundation for a communication plan. Your approach to communication may include:

- a formal proposal to the building owner about how and why to improve energy management
- the inclusion of energy management as a standing agenda on business planning and management meetings
- the inclusion of energy management as a standing agenda on regular tenant meetings.

You may also consider establishing an energy management team. Team members can play an important role in engaging staff and stakeholders that they interact with to promote the importance of energy management, to bring in new ideas and promote achievements as they are delivered.

⁹ <https://www.energy.gov.au/government-priorities/energy-productivity-and-energy-efficiency/national-energy-productivity-plan>

¹⁰ See National Energy Productivity Plan

¹¹ <https://www.ess.nsw.gov.au/>

¹² <https://www.victorianenergysaver.vic.gov.au>

¹³ <https://www.actsmart.act.gov.au>

¹⁴ <https://www.escosa.sa.gov.au/industry/rees/overview>

3. Source, analyse and report energy data

Review relevant data and information to establish building energy performance, to obtain insights into areas of potential improvement and, to monitor progress.

Whether you are new to managing a particular building or have many years of experience in the same building, reviewing operations from an energy perspective will not only provide insights into ways of improving energy management, but also provide new insights into existing problems. For example, persistent complaints around comfort issues may be the result of poor maintenance or incorrect operation of HVAC systems. Addressing existing issues can minimise complaints and also reduce energy consumption, costs and greenhouse gas emissions.

Prior to collecting the relevant data it is important to establish the scope of energy consumption that you are looking to manage. For example, if a building has tenants, consider whether to include the base building (central services like HVAC systems, lifts and lobby lighting), the space occupied by tenants or the building as a whole.

You should also consider the fuel types that are relevant to each facility. While grid electricity is the most common, other fuel sources may include gas, diesel (e.g. if used for back-up power) and/or solar panels. For clarity, this chapter uses electricity examples. However, the same approaches can be applied to other fuel types.

Given the multidimensional nature of energy management, there is no single source of data that provides all relevant insights and answers. As well as the data sources outlined in Table 4, it is important to speak with the various stakeholders that interact with a building to understand and then to coordinate actions that will improve a building’s energy performance.

Data gathering for energy management is best approached as a ‘top down’ process. It starts with high level information such as energy bills and works through to more detailed data in a structured way. Each new level of detail will provide useful insights and build an understanding of energy and its relationship to building activities on the basis of accurate data rather than anecdotal assumptions that may be incorrect.

The frequency with which data is available can also impact on the sophistication of an analysis and opportunities to respond to energy wastage. For example, monthly bills provide an overview

Table 4. Key data sources that provide insights for energy management

Data source	Description
Energy bills / contracts	Energy consumption over time, breakdown of costs (supply, consumption, peak charges)
Electricity interval data	Electricity use provided by electricity retailer showing energy consumption broken down into 15- or 30-minute intervals
Building management system	Historical and real-time information on energy consumption and building operations
Energy Information System	Captures and presents energy use data in a format to facilitate the identification of excessive energy consumption and opportunities for improved efficiency
Meter maps	Breakdown of energy use in different parts of the building
Asset register	Equipment in the building and installation date, modifications that have been made, condition, major overhaul dates, environmental performance

of energy consumption and support the identification of long-term trends. However, interval data (e.g. energy data showing energy consumption every 15 minutes) can provide for deeper analysis and enable corrective measures to be implemented more quickly.

While there are many different ways to analyse energy data, this chapter presents three fundamental approaches to energy data analysis that are relevant to FMs:

- reviewing energy bills and gathering monthly consumption data
- developing a basic energy balance to establish a baseline for energy consumption
- examining energy consumption by time of use using interval data

Throughout the chapter, examples are provided for analysis of electricity data, as this is the most dominant source of electricity. For more information on the analysis of gas, refer to the NSW Government’s Gas Measurement and Monitoring Guide.¹⁵

¹⁵ <https://www.environment.nsw.gov.au/resources/business/gas-measurement-monitoring-guide-160302.pdf>

It is important to recognise that the information that would be useful to improve energy management will not always be available. Typically, data improvements are built up over time. Therefore, it is important to note the data gaps that exist and to consider ways of addressing them. It may be relevant to seek funding for improvements in submetering or energy monitoring software where it can be shown that improved data can deliver energy savings and other benefits.

3.1 Review energy bills

Energy bills provide a first port of call for energy management. At a broad level they provide an insight into energy consumption and tariff structures.

As you work through your bill consider the following:

- What areas of the building are being captured? Each bill will correspond with a specific billing meter. In the case of electricity, each meter has a unique National Metering Identifier (NMI) number. Ensure that you understand what areas of the building each meter covers.
- Is your electricity bill 'bundled' or 'unbundled'? 'Unbundled' bills are typically available to large customers and detail all of the charges associated with the supply of energy including metering fees, network charges and other factors. 'Bundled' bills are more common for Small and Medium Enterprises (SMEs).
- Is a portion of your energy sourced from renewables? This should be explicitly outlined on the bill or it may be available in a separate bill.
- Which areas can you influence through improved energy management? The two main areas are the amount of energy consumed and maximum (peak) power demand.

If you do not understand any aspect of your energy bill, get in contact with the person responsible for procuring energy in your organisation and/or your energy supplier. Stepping through the bill with someone who understand its intricacies can be the best way to understand it. Energy suppliers may also be able to provide additional energy consumption data in a form that is easier to analyse – so it is important to find out what is available.

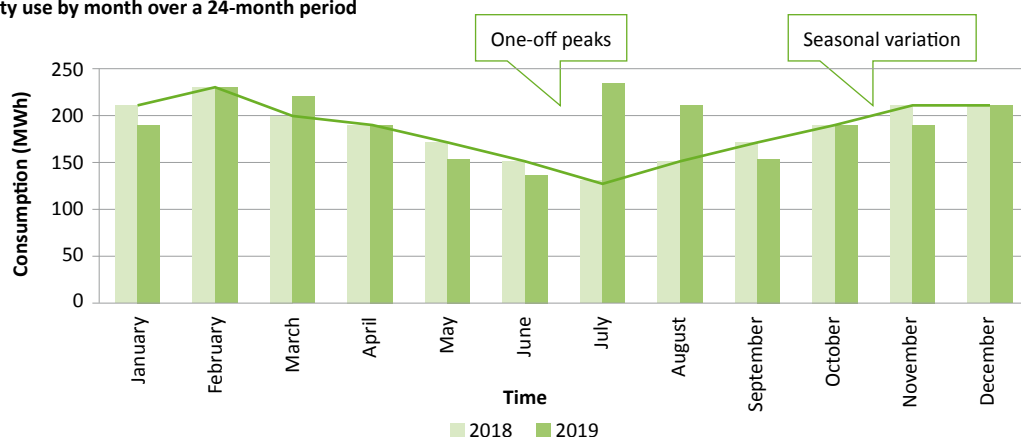
You can use energy bills to create a picture of energy consumption on a monthly basis over a 24-month period. Figure 2 provides an indicative case. It clearly demonstrates a seasonal variation over the period with higher consumption in summer compared to winter due to additional cooling demands. The one-off peaks that are shown for July and August 2019 require further investigation. The higher level of energy consumption in July and August 2019 may have been influenced by warmer temperatures, equipment malfunctions or changes in building occupancy.

This level of data can raise many questions, but it is an important step in identifying potential areas for improvement. It can help to highlight seasonal influences but may not directly account for other variables such as changes in occupancy. It can also provide you with baseline data that you can use to compare improvements once energy management initiatives are put in place.

Potential opportunity areas:

- Do you have the best contract in place? Speak with the person in your organisation that is responsible for procuring energy.
- Could more renewable energy be included in the contract?
- What is the potential saving from reducing energy use in ways that would minimise any peak demand charges?

Figure 2: Electricity use by month over a 24-month period



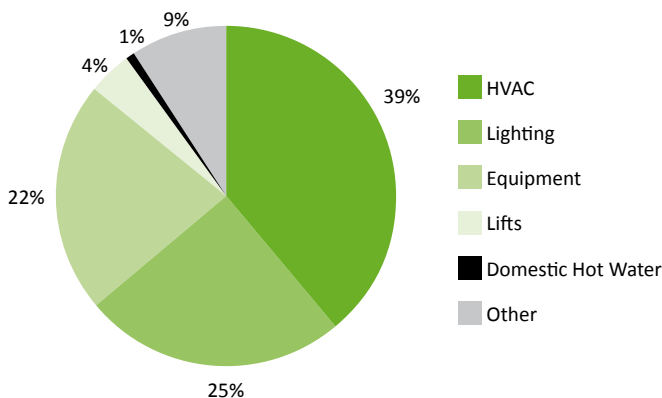
Tip: Contact your energy retailer to establish what data they can share with you. This can reduce the time needed to develop a monthly energy comparison. Typically, they can provide more frequent energy data – even down to 15-minute intervals.

3.2 Develop a simple energy balance to show energy consumption by area of use

An important next level of data analysis is to break down energy consumption by area of use.

This requires greater detail than is typically available in an energy bill. Data sources include sub-meters, power ratings and the daily operating hours of equipment. Ideally, a building will have a Building Management System (BMS) and/or energy management software that provides the breakdown of energy consumption in an easily accessible form. Figure 3 shows the typical energy consumption by area of use in an office building.

Figure 3: Basic energy balance for a typical office building¹⁶



An energy balance provides a good understanding of the major energy uses in a building and that areas that present the most potential for improvement.

3.3 Explore energy consumption by time of use (load profiles)

Energy is used to varied extents throughout the day. A breakdown of energy consumption over short periods (e.g. 15 minutes) can help to provide insights into where energy is used and potentially wasted. High resolution data can also provide more informative insights into the range of factors that influence energy use variations including:

- weather conditions
- operating hours
- use of specialist equipment (e.g. in hospitals)

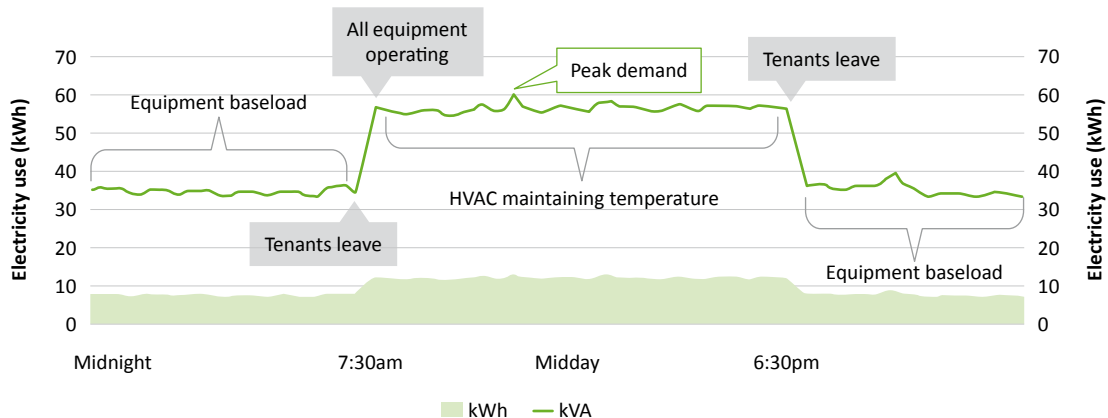
Interval data may be accessed from utility providers, building management systems or a specialised Energy Information System (EIS).¹⁷ The format of the data can vary but most systems will allow for load profile graphs to be developed as a system output. These graphs show the variation of energy consumption over time on the basis of the time interval available for the data.

If it is the first time that load profile graphs are being examined in detail, then it is useful to bring together relevant stakeholders – including electrical and mechanical contracts and tenants – to explore how energy is being used and the opportunities for savings, such as turning off equipment that may be left on or in standby unnecessarily. Load profiles should also be reviewed as part of an energy audit.

Following a detailed analysis of load profiles, they can be reviewed on a frequent basis. For example, a brief check once a day can help to identify any significant anomalies that should be addressed. Load profiles can also help to determine the impact of energy efficiency initiatives as they are implemented.

Take for example the indicative load profile provided in Figure 4. The green line indicates electricity demand for the building at 30-minute intervals. The graph highlights a number of questions to consider when reviewing your own interval data.

Figure 4: Load profile over a 24-hour period in an office building¹⁸



16 Source: COAG 2012. Guide to Best Practice Maintenance and Operation of HVAC Systems for Energy Efficiency. p36.

17 For more information on the scope of EISs see <https://eta-publications.lbl.gov/sites/default/files/6476e.pdf>

18 Source: Energy Management for Facilities Management Training Course, NSW Department of Planning, Industry and Environment

Areas to consider include:

- Equipment baseload: Energy consumed overnight when there are no building occupants is referred to as the energy baseload. It reflects the operation of essential equipment (e.g. safety lighting, refrigeration etc.) but may also include equipment that is left operating that may be able to be scaled down (e.g. escalators, lights in common areas etc.). Consider:
 - Is the baseload as low as it could be? For example, some equipment may be left on unnecessarily.
 - That causes might there be for spikes in energy consumption overnight?
- Tenant arrival: As occupants begin to use the building, they require air conditioning, lighting and other services. Consider:
 - Do tenants actually arrive at this time or are services scheduled to turn on at a set time?
 - Are there opportunities to save energy and develop a more targeted approach?
 - Can the start-up and shut-down procedures for the HVAC system be improved?
- The peak demand line shows the time in the day that the most energy is used. Given that there may be a peak demand charge in billing arrangements it can be worthwhile to minimise this peak. Consider:
 - what causes peak demand and how can it be minimised?

Further insights into energy consumption can be found by examining load profiles over longer periods – for example, by comparing a seven-day period (Figure 5).

Some areas to consider are:

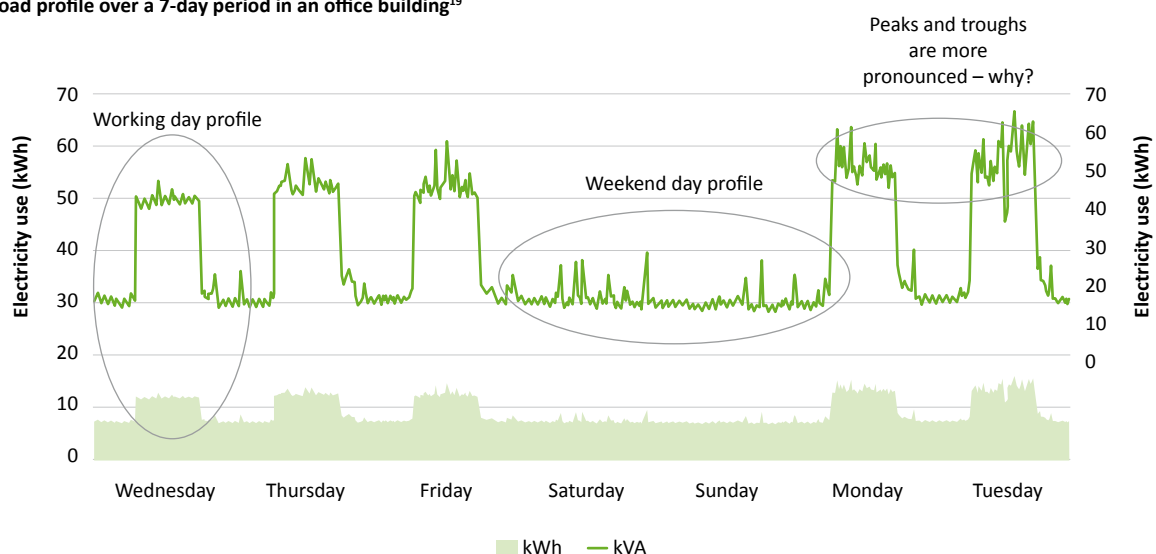
- Typical working day profile provides an indication of the energy use that you would expect on a typical working day. Consider:
 - to what extent does energy use over different days vary? Why? (e.g. external temperature, occupancy)
 - Is the overnight baseload consistent or is it lower on some days more than others?
 - How does the weekend, public holidays or other major events alter the load profile? Are there unnecessary spikes in energy use? Could there be further reductions in energy consumption over these times? For example by improving the operation of central HVAC plant, air handling units, outside air dampers etc.

Remember that energy consumption is influenced by a variety of factors. These include outside air temperature, humidity and occupant behaviour. Despite the challenges of establishing the causes of changes in energy consumption, a review using the simple tools outlined in this chapter can provide useful insights into the areas to investigate further to identify and implement energy efficiency initiatives.

3.4 Benchmarking and reporting energy performance

Benchmarking for energy management involves comparing the performance of a single or multiple buildings over time. By comparing building performance on a regular basis, insights can be gained into the energy management initiatives that have worked as

Figure 5: Load profile over a 7-day period in an office building¹⁹

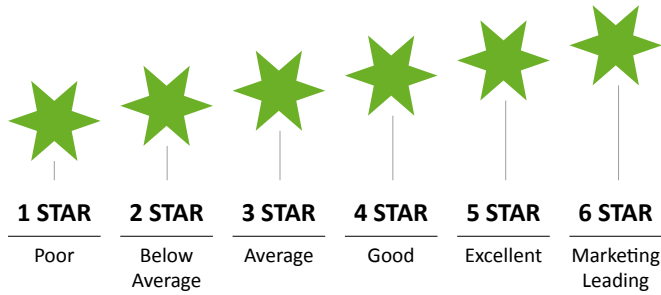


¹⁹ Source: Energy Management for Facilities Management Training Course, NSW Department of Planning, Industry and Environment

well as potential future opportunities. Benchmarking can be done for different aspects of energy management. A number of tools are available to assist the benchmarking process.

The most prominent example of benchmarking in the commercial building space is the NABERS rating tool. A NABERS rating takes into account a range of variables that can influence energy use – including floor space and occupancy. Consideration of these variables allows for meaningful comparisons to be made from one building to another.

Figure 6: NABERS ratings enable simple yet meaningful comparisons of building performance with similar buildings²⁰



Other ratings tools such as GreenStar and the survey approach applied in the GRESB also provide meaningful benchmarking comparisons. Benchmarking can also be done at the level of building systems and equipment.

Reporting on energy management can also be conducted at various levels. Some organisations may have mandatory reporting requirements under the National Greenhouse and Energy Reporting Act (2007)²¹ for example.

At an operational level energy reporting can be used to engage stakeholders and maintain a focus on energy performance.

Operational reports might include:

- A monthly review of energy performance
- Updates on the implementation of energy projects through a project register
- Projections against current energy targets and other key performance indicators (e.g. NABERS ratings)
- Changes in greenhouse gas emissions over time

In reporting energy performance, it is important to carefully account for variables that could influence the consumption and cost of energy. As mentioned previously, these include changes in occupancy, weather conditions and equipment. It is also important to clearly differentiate between energy consumption and cost. For example, energy management initiatives may have improved efficiency but, when combined with energy cost increases, management may question the value of the energy management program. In this case it is useful to compare projected energy costs *without* the implementation of energy management initiatives to current energy costs. Careful analysis will also assist in budgeting for future energy costs.



²⁰ Source: <https://www.nabers.gov.au>

²¹ See NGER Act www.cleanenergyregulator.gov.au/NGER

4. Identify opportunities to improve energy performance

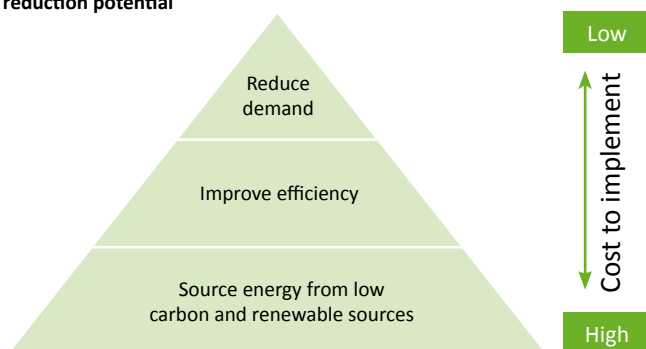
Work with building stakeholders to identify and prioritise the energy management opportunities that will maximise value.

4.1 Approaches to identifying opportunities

Aim to achieve 'early wins'

In facilities where energy management is being introduced in a structured way for the first time, it is important to demonstrate benefits as early as possible. Typically, there will be a number of low and no-cost initiatives that can be implemented quickly. For example, energy saving initiatives (e.g. turning off unnecessary equipment at the end of the day, changing set point temperatures for heating and cooling) could be implemented prior to energy efficiency and renewable energy initiatives, which typically involve greater analysis and capital input to implement (Figure 7). Changes to energy supply contracts can also provide early financial benefits that demonstrate the value of the energy management program.

Figure 7: Cost of energy initiatives relative to GHG emission reduction potential



Establish an opportunity register

Opportunities to improve energy management can be sourced from a variety of places and at different times. To support continuous improvement it is important to establish an energy management opportunity register. The register should include a list of all potential ideas that have been identified and their current status. This systematic approach can help to ensure that you focus on identifying and prioritising the most cost-effective opportunities and implement them in a structured manner.

Review energy data, business and planning documentation

A good place to start identifying opportunities is to gather and work through the data and analysis outlined in the previous chapter. As you become more familiar with the data and build an understanding of the ways in which energy is being used in the building, more opportunities will be identified.

Also – look at other building and business planning documentation to identify areas of focus. Table 5 lists some useful documents and the potential insights that they can provide. Careful review of these documents can help to avoid ‘reinventing the wheel’, link energy management to existing business challenges and leverage projects that may also be planned for implementation.

Table 5: Business and planning documentation

Data source	Potential insights
Leasing schedule	Windows of opportunity for major refurbishments and market enhancement
Maintenance / Operating expenditure (OPEX) schedules	Operability and maintenance issues, approach, protocols and scheduling
Asset register	Equipment in the building and installation date, modifications that have been made, condition, major overhaul dates, environmental performance
Environmental ratings	e.g. NABERS, GreenStar and results of GRESB surveys
Capital expenditure	Mid- to long-term budget preparation and approval/ planned expenditure
Tenant concerns log	Problems requiring rectification
Past energy audits	Previously identified energy efficiency opportunities

Tip: Where there are plans to replace existing equipment check on the process to see if energy efficiency and life cycle costing has been considered. Often there can be a tendency to replace equipment on a ‘like for like’ basis rather than considering more efficient and effective options.

Conduct an energy audit

Your role, available resources and experience will vary; therefore it is often relevant to involve an energy professional to review your energy use to identify opportunities. This is typically conducted through a formalised ‘energy audit’. As well as the ‘time’ advantages of having someone conduct an audit, they will also be able to share perspectives on the typical opportunities that have been identified in other buildings.

The scope of an energy audit can vary. The energy audit standard AS/NZS 3598.1:2014²² outlines 3 different types of energy audit:

22 <https://www.standards.org.au/standards-catalogue/sa-snz/electrotechnology/en-001/as-slash-nzs--3598-dot-1-colon-2014>

- Type 1 is a broad ‘overview’ energy audit that is typically used as a preliminary investigation
- Type 2 is an intermediate energy audit with costs and savings estimates for specific improvement measures provided
- Type 3 is a comprehensive energy audit in which costs and savings for specific measures are informed by detailed data (e.g. submetering data).

Key success factors for an energy audit include:

- providing a clear briefing upfront on the scope of the audit to ensure that expectations are clear
- ensuring that the auditor has access to relevant data
- sourcing an energy auditor that has an understanding of your building type and size, as well as the technology that is being utilised.

It is also important to understand the level of detail that is needed for an audit to be effective. If limited work has been done previously,

then a basic energy audit may be sufficient. That is because it can identify some key opportunities upfront and lead to a quicker focus on improvement in those areas. A more comprehensive audit may be appropriate where there is a lot of data to analyse and large potential improvements, which require specific engineering input, have been identified.^{23, 24}

The audit should lead to and guide future decision-making by focusing on areas that show potential improvement. This can encourage and support ongoing improvement.

Conduct a supplier/ subcontractor workshop

Another approach to identifying opportunities is to bring together the technical service providers in the building for a series of meetings or a workshop. For example, you might include the electrical, mechanical and controls contractors. It can be useful to have relevant energy data available (e.g. daily and weekly load profiles) to interrogate potential opportunities for improvement.²⁵

It is also important to consider specific requirements in service level agreements (SLAs) and to potentially suggest inclusion of energy management within them.



23 For further guidance refer to the Energy Efficiency Council’s Quick Reference Guide to Energy Auditing [https://www.eec.org.au/uploads/Sector Development/Quick Reference Guide.pdf](https://www.eec.org.au/uploads/Sector%20Development/Quick%20Reference%20Guide.pdf)

24 See the CitySwitch guides to office energy audits <https://www.cityswitch.net.au/Resources>

25 See a case study of the GPT Group adopting this approach <https://www.environment.nsw.gov.au/resources/business/120107-cs-gpt.pdf>

4.2 Summary of key opportunity areas

Energy supply

Opportunities include cost savings through a review of existing energy contracts through to exploring opportunities for the use of solar and battery back-up power and the direct purchase of renewable electricity to reduce greenhouse gas emissions.	
Review energy supply contracts to identify cost savings and to minimise greenhouse gas emissions	With increasing competitiveness within the energy market, contract offerings can change over time. A review of energy supply contracts can provide an early source of energy savings if the existing contract is not well-matched to the load requirements of the business, through renegotiation of an existing contract or by 'shopping around' for a new contract. Small businesses can take advantage of the government-funded Small Business Energy Check to compare their energy spend with similar businesses. ²⁶
Consider on-site solar	On-site solar can provide a cost-effective source of energy across a range of building types. Particular opportunities include shopping centres and warehouses due to the potential for large installations. Typically, solar installations are sized in ways that align with energy consumption within the facility itself. ²⁷ It is important to note that the structural capacity of the building to support the weight of a solar energy system should be confirmed by a structural engineer. Solar energy systems can include online monitoring and, once installed, it is important to ensure systems are maintained, operate as intended, and are reviewed for any faults that could diminish performance.
Explore battery storage solutions	Battery storage is becoming more cost effective for buildings that have on-site PV systems. The full value proposition for batteries needs to be based on an holistic perspective that takes into account the range of applications that battery storage can deliver. These include time-of-use tariff optimisation, reducing capacity charges, back up during blackouts and opportunities to sell power back to the grid at peak times. ²⁸
Consider opportunities for a renewable energy power purchase agreement	Large energy buyers are able to enter into direct agreements with renewable energy generators. These 'power purchase agreements' create opportunities to source renewable energy at competitive prices. ²⁹
Purchase GreenPower ³⁰	GreenPower is a government-managed scheme ³⁰ that provides energy consumers with the opportunity to displace a proportion of their electricity use with renewable energy. While this may increase energy bills, it provides a way for businesses to reduce their greenhouse gas emissions. Businesses that purchase 10% or more of their annual electricity usage from GreenPower Customer Logo on marketing and business materials.

Building controls and software

Building controls and the software that powers them can facilitate significant improvements to the energy management of buildings. For example, Energy Management and Information Systems (EMIS) can be made up of a range of tools and services that can be used to manage commercial building energy use. The technologies that are available include:	
<ul style="list-style-type: none"> • fault detection and diagnostic systems • benchmarking and utility bill tracking tools • automated system optimisation tools • building automation systems. 	
Building systems	Check what systems are available in the building and how they can be used for energy management.
System upgrades	Find out whether there are any plans to upgrade existing systems.
Additional functionality	Consider how additional functionality could add value to the building in terms of energy efficiency, comfort and productivity. ³¹

26 See <https://www.checkyourenergyspend.com.au>

27 For further information refer to the Clean Energy Council Guide to Installing Solar PV for Business and Industry <https://assets.cleanenergycouncil.org.au/documents/consumers/solar-guide-for-business.pdf>

28 For further information refer to the NSW Government's Solar Storage Guide <https://www.environment.nsw.gov.au/resources/business/battery-storage-guide-160675.pdf>

29 For further information refer to the NSW Guide to Corporate Power Purchase Agreements <https://www.energetics.com.au/media/1825/wwf1452-updated-nav-corp-ppas-web-21.pdf>

30 See the GreenPower for Businesses Guide <https://www.greenpower.gov.au/Business/Business-Guide>

31 Useful information in this complex area is available from the Buildings Solutions Centre <https://betterbuildingssolutioncenter.energy.gov/alliance/technology-solution/energy-management-information-systems>

HVAC

<p>HVAC Usually consumes the larger proportion of energy in commercial buildings. The quality and reliability of air conditioning contributes directly to occupant comfort, safety and productivity.</p> <p>It is important to plan for HVAC equipment replacement well in advance of its failure, to provide time for options to be considered and the most efficient and effective replacement to be selected. The engagement of a mechanical engineer to review HVAC replacement options and design the most efficient replacement solution can improve outcomes.</p>							
<p>Consider leasing arrangements and communications with tenants</p>	<p>For buildings with tenants, it is important to review leasing arrangements, as they may include requirements to achieve specific comfort standards and/or environmental performance. It is important to ensure that any changes to HVAC systems that impact on tenants involve careful consultation, as any negative impacts on comfort or productivity can create a barrier to change. In cases where there are energy/NABERS targets in place, a collaborative approach can also streamline the process and improve the likely success of an energy management program.</p>						
<p>Adjust temperature set points and control bands</p>	<p>It is estimated that changing the space temperature set point by one degree can affect the energy consumption of cooling or heating by around ten percent. Recommended HVAC settings that provide acceptable comfort conditions with reasonable energy efficiency are typically 20-22 degrees in winter and 24-26 degrees in summer.</p>						
<p>Modify start and stop times</p>	<p>The optimum start times for HVAC systems match the time in which each 'zone' in the building is being used. Conversely, the optimum stop time is the time in which the system can be shut off while still maintaining the required temperature levels.³²</p>						
<p>Other optimisation opportunities</p>	<p>There are a number of other low-cost changes that can be made to a HVAC system to improve efficiency while maintaining appropriate comfort levels for building occupants. These include staging chillers and compressors, ensuring that appropriate maintenance procedures are implemented, and optimising existing fan/pump distribution systems.³³ A suite of measures can be implemented as part of a building 're-tuning' program.³⁴ Establishing a regular maintenance program can help maintain the benefits.³⁵</p>						
<p>HVAC upgrades</p>	<p>It is important to refer to the building asset register and capital plan to establish whether there are any plans for upgrades to the HVAC system. If not, it may be worth investigating whether equipment is coming close to its functional life, and the impacts on reliability, maintenance costs and operating costs. Highlighting the full life-cycle cost of the equipment and the value it adds in terms of retaining and attracting tenants may lead to a compelling business case.</p> <p>Figure 8. Typical lifecycle for HVAC equipment³⁶</p> <table border="1"> <thead> <tr> <th>SHORT 2-5 YEARS</th> <th>MID 5-10 YEARS</th> <th>LONG 10-20 YEARS</th> </tr> </thead> <tbody> <tr> <td>Air filters, drive belts, bearings</td> <td>Split AC units, motors, tenancy fit out, air distribution and control</td> <td>Cooling towers, pumps, fans, packed AC units, variable air volume units, building automation and controls, chillers, boilers</td> </tr> </tbody> </table>	SHORT 2-5 YEARS	MID 5-10 YEARS	LONG 10-20 YEARS	Air filters, drive belts, bearings	Split AC units, motors, tenancy fit out, air distribution and control	Cooling towers, pumps, fans, packed AC units, variable air volume units, building automation and controls, chillers, boilers
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32 https://www.airah.org.au/Content_Files/HVACRNation/2015/08-15-HVACR-003.pdf

33 See the NSW Government's HVAC Optimisation Guide for a complete list of opportunities <https://www.environment.nsw.gov.au/resources/business/150317HVACGuide.pdf>

34 https://www.energy.gov.au/sites/default/files/hvac-factsheet-basics-energy-efficiency.pdf?acsf_files_redirect

35 See the AIRAH guide to developing a HVAC maintenance program <https://da19fmuserguide.com/>

36 Source: NSW Government's HVAC Optimisation Guide for a complete list of opportunities <https://www.environment.nsw.gov.au/resources/business/150317HVACGuide.pdf>

Lighting

Lighting serves a number of important functions within buildings. For example, it:

- enables tasks to be completed safely and effectively
- enhances security
- contributes towards the overall health and productivity of building occupants.

Energy efficiency in lighting has improved significantly due to the introduction of new lighting technology such as LEDs as well as control systems. If a lighting system has not been upgraded for many years, then it is likely that a lighting upgrade may be a cost-effective option that not only saves money but also adds to the amenity, safety and wellbeing of building occupants.

While there may be opportunities to simply change-out existing lamps with more efficient options, it is important to ensure that lighting is 'fit-for-purpose' and meets relevant standards. It is useful to adopt a sequential approach to lighting opportunities – starting with considerations of ways in which natural light might be utilised, the use of sensors and other control systems through to direct lamp modifications.

Natural lighting	Assess the natural light available and potential for improvement (e.g. skylights) – introduce natural light into open spaces such as warehouses.
Daylight sensors and smart controls	Link artificial light use to the natural light levels (daylight linking) using sensors and smart control systems to minimise energy use.
De-lamping, dimming and switching	Assess options for zoning, de-lamping, dimming or multilevel switching to reduce energy consumption.
Occupancy sensors	Identify low activity areas and assess use of occupancy sensors.
Zoning	Review zoning and increase amount of zones (if appropriate) to allow lights to be turned off when areas are not used.
Upgrades	Identify lights that could be upgraded with more energy efficient lighting. ³⁷ While LED lights present significant energy savings and other benefits, it is important to buy quality lamps and to ensure they are the required brightness, colour temperature and have an appropriate beam angle. ³⁸

Office equipment

Improving the energy efficiency of office equipment can provide improvements that are relatively easy to make. At the same time, changes at this level provide a strong message to building occupants that energy efficiency is a focus and that they can play a role.

As with other energy efficiency initiatives it is important to consider the impact on end users. In relation to computers for example, there may be some requirements for computers to be upgraded. Work with IT staff to identify how this can be achieved in the most energy efficient way.

Turn it off	Turn off or remove equipment that is not used.
Enable sleep mode	Enable automatic 'sleep' and 'turn off' modes on equipment wherever possible
Energy star ratings	Consider energy star ratings for office equipment when it is being purchased.
Implement protocols	Implement a protocol that allows office equipment to be turned off at the end of the day and check this through regular audits. ³⁹

Other opportunity areas

There are a number of other opportunity areas that are specific to the ways in which buildings are used in particular sectors. The most significant opportunities in key sectors / building types have been included in the 'Quick start guides' provided in Appendix C. Links are also provided to sector specific resources to assist in identifying and implementing relevant opportunities.

³⁷ Refer to the Energy Efficient Lighting technology report for more information <https://energysaver.nsw.gov.au/media/1066/download>

³⁸ Refer to the Lighting Councils LED Buyer's Guide for more information <https://www.lightingcouncil.com.au/wp-content/uploads/2018/12/Lighting-Council-Australia-LED-Buyers-Guide.pdf>

³⁹ The CitySwitch program provides a useful office equipment audit checklist and guide to energy efficient office equipment <https://cityswitch.net.au/Portals/0/GUIDE%20-%20CitySwitch%20Beginner%20s%20Guide%20to%20Energy%20Efficient%20Office%20Equipment.pdf>

5. Get funding to support energy management projects

Develop business case proposals and incorporate funding options to support the implementation of energy management initiatives.

As described earlier in this guide, there are a number of energy management initiatives that can be put in place that require a relatively low level of investment. Others – such as sourcing renewable energy or obtaining funding for equipment replacement – can require substantial funding.

In many cases the availability of capital within a business can be scarce. Like other aspects of energy management, success often depends on thinking strategically about the best approach to obtaining the funding and management support needed to resource a project.

This means that to obtain funding it is important to:

- Develop business case proposals that have impact
- When internal funding is unavailable, look to leverage financing sources that may be available from outside the organisation.

5.1 Put a business case proposal together

FMs can play an important role in preparing business case proposals for energy management projects. Funding may be sourced from within the business through the use of discretionary funds or budget allocations. Government grants and certificate-based energy efficiency schemes provide alternative options. A range of other funding options are available including loans, leases and performance-based contracting.

Business case proposals should be developed in a way that is compelling, clear and builds the support of key stakeholders throughout their development. While every business case proposal is different, there are some common characteristics that should be considered for all projects. These are presented below. These points should be considered in conjunction with the business case template provided in Appendix A.

Establish who the final decision-maker is and what information they require

The development of an effective business case proposal requires a good understanding of the information and data required by the

project funder so it is important to establish who will be making the final decision to approve or reject the business case proposal. Smaller and lower cost projects may be signed off by operational managers who have a good understanding of the building and the nature of operations. Larger projects may require support from senior managers or an owner who may require more comprehensive financial and risk management information. It is useful to clarify these requirements for your proposal early in the process.

Identify and consult with project stakeholders

Before obtaining the support of the final decision-makers there may be a number of stakeholders that will need to provide support along the way. For example, projects that impact on tenants should involve careful consultation to build their support early in the process. Conduct a stakeholder analysis by listing each key stakeholder, considering their influence and the way in which you will engage with them.

Establish all costs and benefits over the project lifetime

Use the best available data and ensure there is full consideration of all costs and benefits for the project. That is essential because while energy savings might be an obvious benefit, organisational priorities will come into play. Therefore, projects that significantly reduce maintenance costs, help to retain a tenant towards the end of a lease or add significant value to a building can be significantly more attractive. In organisations with commitments to a reduction in greenhouse gas emissions it will be important to quantify the expected reductions⁴⁰ and how they will contribute to the organisation's goal. It is also important to take into account the project benefits as they accrue over time by using a life cycle-costing approach.

Calculate financial return using multiple metrics

Financial metrics provide a shorthand way of illustrating the relative value of a project. For example, often a payback period is generated to highlight when the investment in the project will be recouped. It is important to develop the financial metrics that are required by the decision-makers. If none are specified, then a combination of payback period, Internal Rate of Return (IRR) and Net Present Value (NPV) can provide a more complete picture rather than using a single financial metric such as payback.⁴¹

Identify funding options

As discussed below, there are multiple funding options that could be considered. It is important to establish which options are most feasible early in the process.

40 & 41 Useful guidance and examples are available in the Energy Savings Measurement Guide which is available at <https://www.energy.gov.au/publications/energy-savings-measurement-guide>

Assess project risks

While there may be multiple benefits for a project and it may be highly cost effective, if there is the likelihood of significant unintended consequences (e.g. business disruption or safety) it may not be approved. Many organisations have a structured risk assessment process to complete. If this is not available, then consider as a minimum financial, strategic, operational, technical and safety risks associated with the project and outline how those risks will be managed.

Develop a business case summary and write up your proposal

In writing up the proposal it is essential to provide a succinct summary. This should present a compelling value proposition. Then, use all of the information gathered to develop the proposal in the format that the decision-maker requires.

5.2 Explore funding options

Funding is most commonly sourced through internal budget processes for projects. However, if internal funding is not available there are alternative funding options that can be considered for energy management projects (Table 6).⁴²

The most commonly used external funding support for energy efficiency projects comes from market-based energy efficiency schemes. These are available in four states. Utilities are set an energy reduction target that can be achieved by purchasing certificates. This incentivises organisations and energy service providers to develop projects that can meet the requirements of a program. The sale of these certificates is used to offset the overall cost of each project.

These schemes are the:

- NSW Energy Savings Scheme⁴⁴
- Victorian Energy Upgrades⁴⁵
- ACT Energy Efficiency Improvement Scheme⁴⁶
- South Australian Retailer Energy Efficiency Scheme (REES)⁴⁷

An important first step is to consider whether a particular type of energy efficiency project is eligible for certificate creation. If that is the case then it is important to work through the application process prior to the commencement of the project to ensure that all eligibility and administrative requirements can be achieved.

Table 6: External energy management funding options

Finance option	Description	Considerations
Commercial loans	Lender provides capital to a borrower, to be repaid by a certain date.	Some lenders offer better terms for energy management projects.
Leases	The energy efficiency equipment is owned by the financier and the customer obtains the right to use it over a pre-determined period.	The finance is 'off balance sheet' which means that it releases working capital for day-to-day operations or growth.
Utility on-bill financing	Energy retailer/third party financier provides up-front capital costs.	Equipment costs are repaid through a 'debt repayment' charge on energy bills.
Energy Services Agreement (ESA) or Energy Performance Contract (EPA)	A provider designs, constructs, operates and finances the energy efficiency equipment. Customer pays for energy savings through an agreed rate (\$ per avoided unit of energy).	Not suitable for smaller projects and can involve complex contract negotiations.
Environmental Upgrade Finance/ Agreement ⁴³	Lenders provide finance to a building owner for environmental upgrades, with the local council then collecting the repayments through its rates system and passing them on to the lender.	Not available in all local government areas.

⁴² Further detail on these and other options is provided in the NSW Government's Energy Efficiency and Renewables Finance Guide <https://www.environment.nsw.gov.au/resources/business/financing-guide.pdf>

⁴³ Known as Environment Upgrade agreements in NSW (<https://www.business.gov.au/Grants-and-Programs/Environmental-Upgrade-Agreements-NSW>) and Environmental Upgrade Finance in Victoria (<https://www.energy.vic.gov.au/energy-efficiency/environmental-upgrade-agreements>)

⁴⁴ <https://www.ess.nsw.gov.au/Home>

⁴⁵ <https://www.energy.vic.gov.au/energy-efficiency/victorian-energy-upgrades>

⁴⁶ https://www.environment.act.gov.au/energy/smarter-use-of-energy/energy_efficiency_improvement_scheme_eeis

⁴⁷ http://www.energymining.sa.gov.au/energy_and_technical_regulation/energy_efficiency/retailer_energy_efficiency_scheme

6. Implement an energy management system to drive continuous improvement

Establish systems and procedures to support the continuous improvement of energy performance over time.

Even in businesses that have focused on energy management for many years, major business changes can present opportunities to implement new and more substantial initiatives. For example, the decision to undertake a building upgrade or changes in personnel, ownership, occupancy, government policy or the emergence of new, more effective and efficient technologies.

An energy management system can provide a useful mechanism for continuous improvement. Key activities based on the Energy Management Standard ISO 50001 are described in this chapter (Figure 9). Larger organisations may choose to implement the complete management system and seek to obtain ISO 50001 certification. The approach is still relevant for smaller organisations who can select the elements that are most relevant to their size, resources and circumstances.⁴⁸

Plan

Planning is an important first step for the development of an energy management system, as it ensures that management support is established and the future direction for energy management activities is clearly articulated. Key components of the planning phase are as follows.

- Obtain management commitment

Management commitment is essential to support energy management activities and to ensure that sufficient resources are allocated to implement the required initiatives. This can be achieved as part of a broader initiative to engage with key stakeholders as outlined in Chapter 2.

- Establish an energy policy

An energy management policy sets out an organisation’s commitment to energy management and the reasons why improvement is being pursued. It provides a clear message of intent from senior management and establishes the importance of energy management to the organisation.

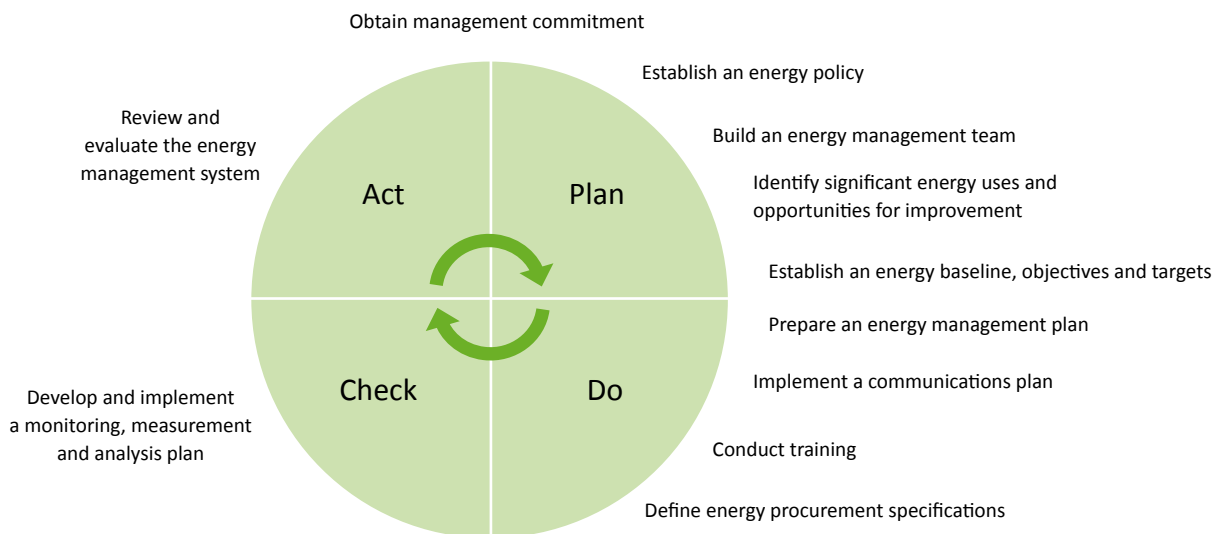
- Build an energy management team

A cross-functional energy management team can support implementation of the system. In particular, team members can play an important role in engaging staff and stakeholders that they interact with to promote the importance of energy management, bring in ideas and maintain ongoing communication of progress.

- Identify significant energy uses and opportunities for improvement

It is important to be clear about the coverage of energy management activities. For example, to establish whether the focus is on an individual building or suite of buildings and whether the system covers the whole building, base building and/or

Figure 9: Key components of an energy management system



48 A useful resource for those looking to implement a certified energy management system is available from the U.S. Department of Energy’s Better Buildings Solutions Centre <https://betterbuildingssolutioncenter.energy.gov/iso-50001/getting-started-iso-50001>

individual tenancies. Coverage should include all significant energy uses and opportunities can be identified through an energy audit or other investigations.

- Establish an energy baseline, objectives and targets

The energy balance that was described in Chapter 3 can be used as an energy baseline. This provides the basis to evaluate the effectiveness of an energy management program. Objectives, energy performance indicators and targets help to set a clear direction for activities and support evaluation of success over time.

These should be established following an investigation of opportunities to ensure that future performance expectations are realistic and achievable. Greenhouse gas emission reduction targets should also be based on recognised standards. These standards include the Australian National Carbon Offset Standard (NCOS)⁴⁹ and the global Science-Based Target initiatives.⁵⁰

- Prepare an energy management plan

An energy management plan provides a clear outline of the activities that will be undertaken to improve energy performance. It should outline the activities to be completed, the resources that are needed and the responsibilities of key personnel.⁵¹

Do

The “do” phase of the PDCA cycle includes ongoing communications, training and energy procurement specifications.

- Implement a communication plan

Internal communication is an essential part of managing change on an ongoing basis. This should include regular reporting to management and other stakeholders to outline progress against goals and objectives.

- Conduct training

Training should be made available to personnel, as it can influence energy efficiency at a facility. This may include facilities managers and technically oriented personnel including electrical, mechanical, general maintenance and controls technicians.⁵²

- Define energy procurement specifications

To comply with ISO 50,001 organisations must clearly outline their specifications for purchasing energy. These may include demand requirements, approximate cost, voltage, current and/or electricity peaking times. The staff involved in energy procurement should understand the components of the energy management system, the organisation’s energy and environmental targets and goals, as well as any specific requirements to purchase renewable energy.

Check

An essential component of continuous improvement is to ensure that performance is monitored on a regular basis. ISO 50,001 specifies that a monitoring, measurement and analysis plan should be developed. The plan should include:

- the scope of the measurement including what systems, processes or equipment will be monitored
- methods and frequency of data collection. For example, load profiles in each facility should be reviewed daily to identify energy use anomalies and to ensure that they are addressed in a timely manner.
- processes for data analysis
- how and when maintenance will be carried out on the measurement equipment (e.g. meter calibration).

Act

The organisation must periodically review and evaluate its activities and energy performance to identify opportunities for improvement. Reviewing the overall system *as well as* the specific technical opportunities for improvement can support continuous improvement over time.

49 See for example the NAB NCOS public disclosure summary <https://www.nab.com.au/content/dam/nabrwd/documents/reports/corporate/2019-national-carbon-offset-standard.pdf>

50 <https://www.sciencebasedtargets.org>

51 An energy management plan template has been provided in Appendix B.

52 A comprehensive list of energy management training opportunities is available at <https://www.energy.gov.au/business/energy-efficiency-skills-and-training/energy-efficiency-training>

Glossary

Energy Information System (EIS)	The software, data acquisition hardware, and communication systems used to store, analyse, and display building energy data ⁵³
Energy management	The process of monitoring, controlling, and minimising energy consumption
Energy management system	Management system to establish an energy policy, objectives, energy targets, action plans and process(es) to achieve the objectives and energy targets ISO 50001:2018 Terms and definitions
Energy management team	Person(s) with responsibility and authority for effective implementation of an energy management system and for delivering energy performance improvement ISO 50001:2018 Terms and definitions
Energy performance	Measurable results related to energy efficiency, energy use and energy consumption ISO 50001:2018 Terms and definitions
Energy performance improvement	Improvement in measurable results of energy efficiency, or energy consumption related to energy use, compared to the energy baseline ISO 50001:2018 Terms and definitions
Energy policy	Statement by the organisation of its overall intention(s), direction(s), and commitment(s) related to its energy performance, as formally expressed by top management ISO 50001:2018 Terms and definitions
Energy baseline	Quantitative reference(s) providing a basis for comparison of energy performance
GRESB	Global Real Estate Sustainability Benchmark
HVAC	Heating, ventilation and air conditioning
ISO 41001 2018	Facility management — Management systems — Requirements with guidance for use https://www.iso.org/standard/68021.html
LED lighting	Light emitting diode
NABERS	National Australian Built Environment Rating System
Normalisation	Modification of data to account for changes to enable comparison of energy performance under equivalent conditions
Service level agreement	Document which has been agreed between the demand organisation and a service provider on performance, measurement and conditions of service delivery ISO 41011:2017 Vocabulary
Significant energy use	Energy use accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement
Stakeholder (also referred to as interested party stakeholder)	Person or organisation that can affect, be affected by, or perceive itself to be affected by a decision or activity ISO 41011:2017 Vocabulary
SME	Small and Medium Enterprises
Facilities management professional (FM)	Person responsible for the effective operational management of the buildings and precincts that form the majority of Australia's built environment, ensuring the health, wellbeing and productivity of Australia's workforce and the wider community ⁵⁴
Facility management / facilities management	Organisational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business ISO 41011:2017

⁵³ Granderson, Lin & Piette 2013. Energy Information Systems (EIS): Technology costs, benefit, and best practice uses <https://eta-publications.lbl.gov/sites/default/files/6476e.pdf>

⁵⁴ <https://www.fma.com.au/faq/what-facilities-management>

Appendix A: Business Case Template

1		OUTLINE PROJECT DETAILS		
PROJECT NAME				
PROJECT LEAD				
LOCATION				
PROJECT AIM				
PROJECT DESCRIPTION				
PROJECT BUDGET				
DESIRED OUTCOMES				
KEY DATES	Due date	Action	Person responsible	
Milestone 1				
Milestone 2				
Milestone 3				
Milestone 4				

2		IDENTIFY PROJECT STAKEHOLDERS	
STAKEHOLDERS	Interest	Notes	
Internal stakeholders			
External stakeholders			

3 ESTABLISH PROJECT COSTS AND BENEFITS		
Business case assumptions	Project life (years)	
	Discount rate for NPV (%)(company cost of capital)	
	Annual energy price increase (%)	
	Average cost of electricity (cost per kWh)	
	Maintenance labour cost \$ per hr	
	Operating hours	
	Other	
OPTION 1*		
Item	Cost	Benefits
TOTAL in first year		

*Replicate table for additional options

4 CALCULATE FINANCIAL RETURN			
FINANCIAL APPRAISAL METHOD	Payback period Payback period = No. of years	Internal rate of return IRR = %	Net present value NPV = \$
Option 1			
Option 2			
Option 3			

5 IDENTIFY FUNDING OPTIONS		
Options	Detail	Next steps
Consider Internal funding (CAPEX/ OPEX), commercial loan, lease, energy saving certificates etc.		

6	ASSESS PROJECT RISKS
	Option
RISKS	How it will be managed
Financial	
Strategic	
Operational/ technical/ safety	
Other	

7	DEVELOP BUSINESS CASE SUMMARY							
PROPOSED PROJECT								
Project description								
Summary of project benefits								
Energy Saving Certificates (if applicable)								
Business case results								
Capital cost \$	Total cost savings \$ pa	Electricity savings kWh pa	Energy cost savings \$ pa	Other cost savings E.g. maintenance	Payback period Years	IRR %	NPV \$	

Budget	
Risk management	
Next steps	

Authorisation

Name	
Position	
Signature	
Date	

Appendix B: Energy Management Plan Template

Introduction

Organisation	
Project sponsor (e.g. senior manager)	
Energy management lead (e.g. FM)	
Plan version (e.g. update to previous or newly established)	
Timeframe	

Strategic context

Benefits	
Barriers	
Drivers	

Policy and targets

Policy	
Organisation-wide target/s and timeframe	
Building specific target/s and timeframe	

Stakeholders

Stakeholder	Their interests	Their influence	Role

Opportunity project register

Project	Description	Status	Next steps

Communications plan

Communication activity	Activity, frequency and timeframe
Management briefings	
Tenant management meetings	
Communication campaigns	
Internal reporting	
External reporting	

Appendix C: Quick Action Guides for specific building types

6.1 Tourist accommodation and hotels

Accommodation providers aim to optimise building occupancy while minimising operating costs. Energy consumption in tourist accommodation and hotels varies widely according to the size, age and level of occupancy of each facility. A structured approach to energy management will bring numerous benefits.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> Attract and retain customers Reduce running costs Improve customer health and comfort Reduce environmental impact 	<ul style="list-style-type: none"> Install timers, occupancy sensors and/or utilise the building management systems to automatically turn off lighting and HVAC in unoccupied spaces and rooms Progressively upgrade lighting to LEDs During periods of low occupancy, shut down entire wings or floors Ensure housekeepers and security staff report and turn off equipment that is left on unnecessarily
Useful resources	
<ul style="list-style-type: none"> The Commonwealth Government and NSW Business Chamber have published a guide to sustainability in the hospitality industry that includes a list of specific energy management opportunities.⁵⁵ Case studies are available through industry sustainability rating organisations including Earth Check⁵⁶ and Green Globe⁵⁷ as well as the Green Hotelier website. 	

6.2 Residential facilities

Rising energy costs and growing awareness of climate change are important considerations for property owners and renters. A structured approach to energy management can help on a number of fronts.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> Healthier homes and apartments Smart investments Reduced environmental impact Market recognition⁵⁸ 	<ul style="list-style-type: none"> Implement maintenance and upgrade opportunities associated with car park air supply and exhaust fans, cooling towers, chillers, swimming pools, saunas and spas Optimise pumping requirements associated with hot and cold water storage systems in high rise residential apartments Consider installing solar panels if there is sufficient roof space Improve lighting controls and upgrade lighting to LED technology⁵⁹
Useful resources	
<ul style="list-style-type: none"> A NABERS rating can be established for the common property areas of apartment buildings including lifts and lobby areas, car parks, gyms, pools and water features. The City of Sydney has developed a suite of resource materials⁶⁰ and case studies⁶¹ to support sustainability improvements in residential apartment buildings. 	

6.3 Office facilities

The energy performance of office buildings in Australia has improved dramatically over the past decade and many Australian office building owners have been identified as world leaders. ⁶² However, there remain significant opportunities for improvement –particularly within smaller, B and C-grade ‘mid-tier’ office buildings.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> Reduced building operating costs Improved operating efficiencies of equipment Higher return on investment Attract and retain tenants Environmental benefits Market recognition⁶³ Improved occupant health, well-being and productivity 	<ul style="list-style-type: none"> Improve lighting controls and upgrade lighting to LED technology⁶⁴ Install timers, occupancy sensors and/or utilise the building management systems to automatically turn off HVAC in unoccupied spaces and rooms Schedule periodic HVAC tuning and maintenance Conduct a night audit to identify equipment that is left on unnecessarily
Useful resources	
<ul style="list-style-type: none"> Useful energy management case study resources are available through the Energy Efficiency Council⁶⁵ and State Government programs (see example case studies developed by Sustainability Victoria).⁶⁶ The national CitySwitch program provides extensive resources for office-based tenants.⁶⁷ 	

55 <http://www.businesschamber.com.au/NSWBC/media/Misc/Policy%20Documents/Sustainability-Toolkit-Hospitality.pdf>

56 <https://earthcheck.org>

57 <https://greenglobe.com/>

58 <https://www.gbca.org.au/green-star/why-use-green-star/why-design-or-build-a-green-residential-building/>

59 <https://energysaver.nsw.gov.au/media/1066/download>

60 <http://greenstrata.com.au/topic/reduce-your-energy-demand>

61 <https://www.cityofsydney.nsw.gov.au/live/residents/sustainable-city-living/smart-green-apartments/sustainability-resource-for-apartments-buildings>

62 <https://gresb.com/global-real-estate-sector-improves-esg-performance-effort-needed-global-goals/>

63 <https://www.gbca.org.au/green-star/why-use-green-star/why-own-a-green-commercial-building/#Operating%20efficiencies>

64 <http://greenstrata.com.au/topic/reduce-your-energy-demand>

65 <https://www.eec.org.au/for-energy-users/energy-efficiency-in-commercial-buildings/overview#/overview>

66 <https://www.sustainability.vic.gov.au/Business/Energy-efficiency-for-business/Commercial-buildings/Case-studies>

67 <https://cityswitch.net.au/Resources/category/cityswitch-resources>

6.4 Educational facilities

Educational facilities, such as schools, universities and research centres, can vary widely in terms of their size, age and energy consumption. Therefore, a careful and customised approach is typically required.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> • A more productive place to learn • A better place to teach • Attractive to students • A reduction in environmental impacts⁶⁸ 	<ul style="list-style-type: none"> • Improve lighting controls and upgrade lighting to LED technology⁶⁹ • Install timers, occupancy sensors and/or utilise the building management systems to automatically turn off HVAC in unoccupied spaces and rooms • Conduct a building or campus level energy audit in conjunction with students • Conduct behaviour-based initiatives, e.g. an “energy challenge” in conjunction with students once a year to raise awareness of energy efficiency
Useful resources	
<ul style="list-style-type: none"> • Useful information for primary and secondary schools is available through a variety of sources. For example, the NSW Government provides an energy portal with resources and case studies.⁷⁰ • Universities typically have their own sustainability resources that are available on their websites. The Australasian Campuses Towards Sustainability⁷¹ organisation provides useful information that is relevant across universities. 	

6.5 Hospitals, health care and aged care facilities

Health care facilities are typically energy intensive due to their 24/7 operation and the extensive use of electrical equipment and hot water.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> • Improved indoor air quality leading to healthier workforce and reduced absenteeism • Create a healthier place to heal and improved occupant well-being • Obtain market recognition • Provide leadership in the community⁷² 	<ul style="list-style-type: none"> • Review hot water requirements and consider energy efficient options • Improve lighting controls and upgrade lighting to LED technology⁷³ • Install timers, occupancy sensors and/or utilise the building management systems to automatically turn off HVAC in unoccupied spaces and rooms • Schedule periodic HVAC tuning and maintenance
Useful resources	
<ul style="list-style-type: none"> • Useful resources include the Health Victoria Hub⁷⁴ and the extensive list of case studies available through the Global, Green, Healthy Hospitals website.⁷⁵ 	

6.6 Industrial/mining facilities

Industrial and mining facilities are high energy users.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> • Reduce operating costs • Improve productivity • Reduce maintenance costs • Improve reputation by reducing greenhouse gas emissions 	<ul style="list-style-type: none"> • Improve efficiency of lighting systems in buildings • Fix leaks and upgrade compressed air systems • Optimise boilers and steam systems • Enhance the efficiency of process heating systems • Install more efficient HVAC systems • Improve the efficiency of pumping and fan systems • Review and enhance vehicle scheduling, procurement and maintenance
Useful resources	
<p>Due to differences across industrial sub-sectors it is important to access the most relevant information available. Examples include:</p> <ul style="list-style-type: none"> • Leading Practice Handbook: <i>Energy management in mining</i>⁷⁶ • The Australian Alliance for Energy Productivity publication <i>Transforming Energy Productivity in Manufacturing</i>.⁷⁷ 	

68 <https://www.gbca.org.au/green-star/why-use-green-star/why-own-a-green-school/>

69 <https://energysaver.nsw.gov.au/media/1066/download>

70 <https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/sustainability/teaching-and-learning/energy>

71 <https://www.acts.asn.au/>

72 <https://www.gbca.org.au/green-star/why-own-a-green-hospital/>

73 <https://energysaver.nsw.gov.au/media/1066/download>

74 <https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/resources>

75 <https://www2.health.vic.gov.au/hospitals-and-health-services/planning-infrastructure/sustainability/resources/case-studies-on-sustainability>

76 <https://www.industry.gov.au/data-and-publications/leading-practice-handbook-energy-management-in-mining>

77 <https://a2se.org.au/files/pdf/A2EP%20Transforming%20EP%20in%20Manufacturing%20Final.pdf>

6.7 Sports and leisure facilities

Sports and leisure facilities consume a large amount of energy – particularly those that include heated pools.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> • Reduce operating costs • Improve supply of essential services such as hot water • Improve comfort • Improve air quality 	<ul style="list-style-type: none"> • Upgrade lighting • Optimise pool pumping and heating systems • Upgrade to heat pump hot water systems • Tune HVAC systems regularly
Useful resources	
<ul style="list-style-type: none"> • A useful webinar on energy efficiency for sports and leisure facilities has been developed by the U.K Carbon Trust.⁷⁸ It provides an effective overview and can assist in planning the most useful areas of energy consumption to target for improvement. 	

6.8 Transport and infrastructure facilities

Energy consumption in transport and infrastructure facilities can vary widely depending upon the nature of individual facilities. The types of opportunities will vary from one facility to another, but common considerations exist.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> • Reduce operating costs • Reduce greenhouse gas emissions and contribute towards greenhouse gas reduction targets • Build a positive reputation with the community 	<ul style="list-style-type: none"> • Upgrade lighting • Schedule periodic HVAC tuning and maintenance • Improve transport logistics
Useful resources	
<ul style="list-style-type: none"> • Useful information and a sustainability rating scheme that includes a focus on energy management is available from the Infrastructure Sustainability Council of Australia (ISCA).⁷⁹ 	

6.9 Government/special purpose facilities

Energy consumption in government facilities across Australia is influenced by the individual targets developed by local, state and Commonwealth government facility owners. While the nature of opportunities will vary from one facility to another, common opportunities exist.	
Benefits of energy management	Common opportunities to improve
<ul style="list-style-type: none"> • Demonstrate leadership and promote outcomes • Reduce operating costs • Reduce greenhouse gas emissions and contribute towards greenhouse gas reduction targets • Improve occupant comfort and productivity • Build a positive reputation with the community • Meet energy and greenhouse gas reduction targets 	<ul style="list-style-type: none"> • Improve lighting controls and upgrade lighting to LED technology • Install timers, occupancy sensors and/or utilise the building management systems to automatically turn off HVAC in unoccupied spaces and rooms • Retune HVAC systems
Useful resources	
<ul style="list-style-type: none"> • Useful resources can be obtained by reviewing the most relevant quick start guides for the most relevant facility type. 	

⁷⁸ <https://www.youtube.com/watch?v=OSr7rqdWmqw>

⁷⁹ <https://www.isca.org.au/Who-We-Are>

Facility Management Association of Australia

ABN: 57 003 551 844

Suite 4.01, 838 Collins Street
DOCKLANDS VIC 3008

Tel: +61 3 8641 6609
Fax: +61 3 8641 6600

policy@fma.com.au
www.fma.com.au

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Author: Sustainable Business Group
patrick@sbusiness.com.au
0418 453 779